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IMPROVING MILITARY AIRLIFT
EFFICIENCY: NEW FREQUENCY
CHANNEL CHARGING

Report AC001R1

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Executive Summary

IMPROVING MILITARY AIRLIFT EFFICIENCY: NEW FREQUENCY CHANNEL CHARGING

The Military Airlift Command (MAC) routinely incurs substantial financial losses on its Frequency Channels (routes flown on a regular schedule). In FY89 alone, 90 percent of MAC's Frequency Channels incurred losses totaling about \$90 million.

Financial losses result because Frequency Channel airlift is often underutilized, and the requesters (who set the requirements for the service) bear no responsibility for unpaid operating costs. In principle, the Air Force assumes that responsibility, but, in practice, the users of Requirement Channels (routes flown in response to cargo and passenger requirements) are charged higher rates to cover the losses. In this way, MAC provides a hidden financial subsidy to Frequency Channel requesters.

That subsidy makes the regulation of Frequency Channel service extremely difficult. For example, some requesters inappropriately cast new airlift requirements in Frequency Channel terms to take advantage of the subsidy. Others vigorously defend existing Frequency Channels even when cargo and passenger utilization rates are quite low and readiness can be met by other less costly means.

We believe that requesters of Frequency Channel service should assume full financial responsibility for the service provided. A statistical model of financial conditions and interviews with requesters suggest that greater financial responsibility would encourage reduced mission frequency and increased cargo utilization. Moreover, removal of the Frequency Channel subsidy would lower Requirement Channel rates, improve efficiency, and reinvigorate the regulatory process.

We recommend that MAC, in conjunction with the DoD Comptroller, take the following actions:

- *Remove the Hidden Frequency Channel Subsidy.* MAC's current policy of cross-subsidizing Frequency Channel service fosters inefficiency. Accordingly, MAC should lower Requirement Channel rates to the extent that they cover Frequency Channel losses, and the DoD Comptroller should reduce Requirement Channel users' funding by a corresponding amount.
- *Calculate Frequency Channel Financial Losses.* MAC should estimate the expected losses on all existing Frequency Channels on the basis of prior-year records, and the theoretical losses on all new Frequency Channels should be formulated from anticipated utilization rates and operating costs. MAC should then submit these estimates to the DoD Comptroller.
- *Earmark Funding for Requesters.* The DoD Comptroller should ensure that requesters receive funding to represent the financial losses on existing Frequency Channels. Because the requesters are the most knowledgeable about their Frequency Channels, this new funding should encourage increased efficiency without adversely affecting readiness.

These actions will ensure that Frequency Channels operate with greater efficiency without impairing readiness. When readiness considerations dictate, requesters would leave their Frequency Channel missions unchanged and pay all operating costs not covered by users. When requesters introduce Frequency Channel efficiencies, the resultant savings could be reallocated to other transportation or related budgetary uses in that same year — an especially meaningful incentive with currently tight budgets. Subsequently, Frequency Channel efficiencies would translate into decreased transportation requirements, reduced transportation budgets, and lowered Government expenditures.

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CHAPTER 1

FREQUENCY CHANNEL ENVIRONMENT

INTRODUCTION

A Frequency Channel may be established when available airlift transportation, either military or commercial, does not provide the desired frequency of service over a designated route. Such service may be necessary to meet operational necessities, support a mission-sensitive area, or boost the morale of personnel in remote areas. The Military Airlift Command (MAC), as the Department of Defense's (DoD's) single manager for airlift service, is obligated to satisfy the requested service, regardless of utilization rates.

In FY89, more than 90 percent of the Frequency Channels incurred financial losses that totaled nearly \$90 million. Such losses are not new. In 1972, the General Accounting Office concluded that Frequency Channel managers were not paying the full mission cost for the service provided.¹ Subsequently, the Logistics Management Institute (LMI) and MAC expanded upon that conclusion.²

In its FY91 budget submission, MAC cited three options for the charging of Frequency Channels:

- Option 1: Hold Military Service and Unified/Specified Command requesters responsible for financial losses on their Frequency Channels.
- Option 2: Charge the Military Services for Frequency Channel losses
- Option 3: Continue using the current charging system.

¹*Increased Use of Financial Data and an Improved Tariff System Needed by the Military Airlift Command*, General Accounting Office, Washington, D.C., 5 January 1972.

²Narragon, E. A. and J. M. Neil, *Industrial Funds for Transportation Management*, LMI Task 76-7, October 1978; Beyer, Alfred and Lawrence Schwartz, *Transportation Industrial Fund Policy: Improving Efficiency*, LMI Report PL910R1, Bethesda, Md., October 1989; and Military Airlift Command, *Channel Airlift Criteria*, Scott Air Force Base, Ill., February 1984.

To aid in assessing the merits of these options, MAC tasked LMI to determine which financial mechanism best encourages Frequency Channel efficiency, without impairing readiness. This report presents the results of that tasking.

CURRENT CHARGING SYSTEM

It is MAC policy to operate Frequency Channels efficiently without adversely affecting readiness. Implementing that policy is very challenging under the current charging system. Although the requesters essentially establish the operational terms of the Frequency Channels (the routes flown, the frequency of the flights, and the specific aircraft used), they pay only for their specific use of the service. If a particular Frequency Channel is underutilized, the requester does not pay for any of the uncovered operating costs.³ In effect, the requesters of Frequency Channels receive a hidden subsidy, and that subsidy is open-ended — becoming larger as the aircraft are more and more underutilized and as users pay for a smaller fraction of the total operating cost.

In principle, the Air Force assumes the responsibility for Frequency Channel operating costs that are unpaid by users. In actuality, however, the Air Force passes those losses to Requirement Channel users in the form of higher charges. Thus, in effect, Requirement Channel users subsidize Frequency Channel users.

Efficiency Implications

The current payment mechanism used by MAC for Frequency Channels has two implications for the efficiency of military airlift services. First, requesters have little incentive to improve the utilization rates for Frequency Channels. Although lower passenger and cargo requirements should lead to modified Frequency Channel service (to the degree consistent with readiness), requesters do not necessarily change their Frequency Channel missions when requirements change.

Second, Requirement Channel users pay not only for operating costs, but also for the losses on Frequency Channels. Thus, rates for Requirement Channel service are set artificially high, which results in reduced cargo and passenger utilization rates.

³MAC strives for cargo utilization rates of at least 70 percent. This goal is rarely met for Frequency Channels, but it is routinely met for Requirement Channels.

THE REGULATORY PROCESS

Several DoD military airlift regulations describe the procedures for establishing new Frequency Channels as well as for reviewing old ones.⁴ Those regulations assign responsibilities to various organizations in an effort to obtain both high readiness and high efficiency. That regulatory process is explained below.

Establishment of New Service

The Military Services, Unified/Specified Commands, and Defense Logistics Agency forward their Frequency Channel requests to the chief validator, Headquarters, U.S. Air Force. All requests must include the rationale for establishing a Frequency Channel and show why other available or possible transportation services cannot satisfy the mission requirements; the expected monthly passenger and cargo requirements; and any need for special handling (such as for oversized, outsized, or hazardous cargo).

The chief validator then either approves or disapproves the establishment of the new Frequency Channel service. He first determines whether there are user requirements on the proposed Frequency Channel other than those of the requesters. Then, he requests MAC to determine the operating concept and efficiency of the proposed Frequency Channel – including the adequacy of support resources at ports of embarkation and debarkation, the impact on existing airlift structure, and the effect on the Airlift Service Industrial Fund.

Although this process is straightforward, it has several weaknesses. Some requesters inflate their requirements for new Frequency Channels as evidenced by low cargo and passenger utilization rates during the first operating year. Other requesters disguise exclusive Special Assignment Airlift Mission service or short-term Requirement Channel service as Frequency Channel service.

⁴See Department of the Air Force Regulation AFR 76-38, "Air Force Airlift Regulation"; Department of the Army Regulation AR 59-8, "Army Airlift Regulation"; Navy Instruction OPNAVINST 4630.18E, "Navy Airlift Regulation"; Marine Corps Order MCO 4630.6D, "Marine Corps Airlift Regulation"; and Defense Logistics Agency Regulation DLAR 4540.9, "Defense Logistics Agency Airlift Regulation" all prepared in 1982.

Review of Existing Service

The MAC is responsible for advising the chief validator on possible suspensions or cancellations of existing Frequency Channels. MAC is also charged with preparing monthly utilization reports and advising the chief validator when any Frequency Channel has low utilization for 6 consecutive months. The chief validator also expects MAC to undertake a comprehensive, annual review of the efficiency of all Frequency Channels.

The chief validator is responsible for suspending or canceling existing Frequency Channel service on the basis of MAC's monthly utilization reports and annual efficiency reviews, as well as the requesters' readiness concerns.

The regulatory process for reviewing existing Frequency Channels has several shortcomings. Many requesters do not modify or cancel their Frequency Channel service despite very low cargo and passenger utilization rates. Also, MAC's annual efficiency reviews are not current, making the chief validator's evaluation of existing Frequency Channels very difficult. Moreover, the chief validator does not have comprehensive information on the rationales for the Frequency Channels, especially the older ones. These voids in information make it difficult for MAC and the chief validator to execute their regulatory responsibilities.

General Regulatory Conclusion

The DoD's procedures for regulating Frequency Channels need to be improved. The hidden Frequency Channel subsidy encourages requesters to establish new and defend old Frequency Channels even when utilization rates are low and readiness can be met through other means. Both MAC and the chief validator lack the information necessary to undertake effective Frequency Channel reviews. They also have expressed frustration with this subsidy-laden regulatory process, which itself may help to explain some of the information gaps.

CHAPTER 2

POTENTIAL FOR A NEW PAYMENT MECHANISM

In assessing the potential for a new Frequency Channel payment mechanism, we performed two types of tests. First, we analyzed the relationship between each Frequency Channel's financial condition and its operating factors. The purpose of that analysis was to show how requesters, users, and MAC can make operational changes to reduce financial losses, as well as to show whether greater regulatory attention or a new payment mechanism would be the best strategy for improving efficiency.

Second, we interviewed several requesters of Frequency Channel services to determine their willingness to accept greater financial responsibility for requested services. Their reactions may help to define a new payment mechanism.

Both of these tests are discussed in more detail below.

FINANCIAL ANALYSIS

In FY89, MAC's 152 round-trip Frequency Channels lost an average of \$600,000 — some losing as much as \$5.2 million, with others gaining nearly \$2.5 million. To explain the differences, we used the technique of statistical regression analysis to construct a Frequency Channel financial model. That model permitted us to relate the financial condition of each Frequency Channel to its operating conditions. We also used the model to assess whether any specific requester took advantage of the Frequency Channel subsidy more than others. (The Appendix presents the technical development of the Frequency Channel financial model.) Table 2-1 shows the various factors that were considered in constructing the model.

We found that the financial model explains 84 percent of the differences in the FY89 financial condition of the 152 Frequency Channels. All of the operating variables are significantly related to the financial condition of a Frequency Channel, except the inbound and requester factors.

TABLE 2-1
SUMMARY OF FY89 FREQUENCY CHANNEL OPERATIONS

Factor	Numerical values		
	Average	Minimum	Maximum
Round trip statistics			
Financial result (millions of dollars)	-0.6	-5.2	2.5
Missions (annually)	74.6	4.0	364.0
Flying hours (per mission)	8.5	0.0	36.0
Available capacity per mission (tons)	21.3	3.6	64.8
Outbound statistics			
Cargo utilization rate (%)	6.3	0.0	61.1
Passenger utilization rate (%)	4.9	0.0	62.0
Inbound statistics			
Cargo utilization rate (%)	2.3	0.0	22.7
Passenger utilization rate (%)	4.9	0.0	54.7

Source: FY89 Best Route Analysis, Military Airlift Command, Scott Air Force Base, Ill.

The financial model shows that there is very little difference among the requesters in taking advantage of the Frequency Channel subsidy. Controlling for operating factors, the U.S. Pacific Command Frequency Channels show somewhat higher financial losses and the Department of the Army Frequency Channels somewhat lower financial losses, on the average, than those of the other requesters. However, none of those differences is significant.

With financial losses spread relatively evenly among requesters, more regulation of a few requesters cannot be expected to reduce overall financial losses substantially. The losses appear to be systemic, with all requesters benefiting from the hidden Frequency Channel subsidy. Moreover, the current regulatory process itself is not very effective in bringing about efficiency.

The financial model also suggests how requesters, users, and MAC could make operational changes to improve the financial condition of Frequency Channel service materially (Table 2-2). First, and most important, if requesters reduce the number of

annual missions, then the financial losses would be reduced. Each 10 percent reduction in annual missions (e.g., from 74 to 67 for the average Frequency Channel) would improve the financial condition by 8 percent. Second, with a reduction in annual missions, users would tend to accelerate their cargo movements to meet the more restrictive schedules. Alternatively, MAC could increase cargo holding times to increase aircraft utilization rates.¹ Every 10 percent increase in cargo utilization would further improve the financial condition of Frequency Channels by over 4 percent.

TABLE 2-2
FINANCIAL EFFECTS OF OPERATIONAL CHANGES

Operational factor	Hypothetical change (%)	Financial effect (%)
Mission frequency	-10	+ 8.0
Outbound cargo utilization rate	+ 10	+ 4.7
Outbound passenger utilization rate	+ 10	+ 2.2

Source: See the Appendix.

In summary, the model shows that requesters could take actions that directly and indirectly affect the financial condition of Frequency Channels. They could reduce the number of annual missions that are consistent with readiness, directly reducing losses. That action would indirectly increase aircraft utilization rates, further reducing losses. MAC, in turn, could increase cargo holding times [within Uniform Materiel Movement and Issue Priority System (UMMIPS) limitations] to further increase aircraft utilization. A new payment mechanism should ideally provide the financial incentives for all of these actions to take place.

REQUESTER REACTIONS

To test the willingness of requesters to assume more financial responsibility for the efficiency of Frequency Channels, we formulated a notional incentive-based

¹Increasing cargo holding times at aerial ports of embarkation is subject to the restrictions of DoD Directive 4410.6, "Uniform Materiel Movement and Issue Priority System," 30 October 1989. That directive specifies time movement standards that seek to balance transportation costs with inventory pipeline costs.

payment mechanism and then asked several requesters how they would react to its adoption. The elements of that notional payment mechanism are presented below:

- All requesters would receive funding to cover losses on Frequency Channels. The budgets for that funding would be derived by eliminating the Frequency Channel subsidy and by reducing the rates and customers' budgets for Requirement Channels.
- The requesters could use the new funds to pay for Frequency Channel losses if they decide that readiness considerations dominate. Alternatively, they could modify or cancel the service and reallocate the efficiency savings to other Second Destination Transportation and related budgetary category uses during that budget year. The incentive to reallocate funding to other uses is especially meaningful in a period of tight budgets, as at present.
- The requesters' efficiencies in the current fiscal year would result in Government expenditure savings in later years because the efficiencies would translate into lower Frequency Channel requirements and reduced budgets in the outyears.

When we presented these new financial rules to requesters, they indicated that they would re-evaluate their Frequency Channel missions. The Navy requester suggested a range of possible changes to Navy Frequency Channels. For example, the Frequency Channel between Richmond, Australia and Learmonth, Australia could very well be canceled. This Frequency Channel has less than a 5 percent cargo utilization rate and its sensitive mission could be met through other airlift services. The requester said that the resultant savings from the cancellation of this Frequency Channel would be reallocated to more important uses.

In contrast, the Navy's Frequency Channel between Clark Air Force Base in The Philippines and Diego Garcia would probably remain unchanged. This Frequency Channel is dominated by readiness considerations, and, for that reason, the Navy would pay for any operating losses. With such a weighing of readiness against operating cost, this no-change result is perfectly proper.

Both the Army and Navy requesters indicated that they might want to cancel some Frequency Channels that are dominated by civilian agency use if they were permitted to do so. When we brought this situation to the attention of the Transportation Policy Directorate, Office of the Secretary of Defense (OSD), we were informed that civilian agencies can "piggyback" only on those DoD Frequency Channels that are needed by the DoD requesters. Every requester has the flexibility

to either cancel or modify Frequency Channel service according to its requirements and priorities. Any civilian agency using that service would have to satisfy its transportation requirements by other means.

Because the Unified/Specified Commands currently do not receive Second Destination Transportation budgets of their own, they cannot receive funding to represent the losses on their Frequency Channels in order to improve efficiency. For example, an Air Force Specified Command requester indicated that the command would react favorably to our notional payment mechanism if it could receive the necessary funding. More generally, approximately 40 percent of all Frequency Channel losses occurred on those established to support the Unified/Specified Commands. Clearly, any changes to the payment mechanism for Frequency Channel service must address the unique circumstances of those commands.

Our assessment shows that if MAC were to remove the hidden Frequency Channel subsidy and provide the requesters with suitable financial incentives, the requesters would react in ways that would benefit themselves, MAC, and the transportation community as a whole. Some Frequency Channels would be modified or canceled, others would remain unchanged because of readiness considerations. The central point is that requesters are in the best position to improve the efficiency of their Frequency Channels, but they need the authority and the incentive to do so.

CHAPTER 3

ALTERNATIVE FUNDING APPROACHES

In this chapter, we evaluate two approaches for removing the Frequency Channel subsidy and increasing the funding for Frequency Channel service. One approach earmarks funding for use by requesters (the requester funding approach); the other provides funds to the Military Services for their consideration and potential allocation to requesters (i.e., the Military Service funding approach). These two approaches provide very different incentives for encouraging re-evaluation of Frequency Channel services.

Both approaches require increasing the budgets for Frequency Channel service to cover the losses. Those budget increases could be derived by removing the subsidy that comes from the inflated Requirement Channel rates, lowering the budgets of Requirement Channel users by a corresponding amount, and reallocating the released funds to Frequency Channel service.

Table 3-1 summarizes the characteristics of both approaches. It describes how the requester and Military Service funding approaches would establish budgets to cover the losses on existing Frequency Channels, how to treat prospective financial losses on new Frequency Channels, and what the approaches would require in terms of new policies and procedures. After discussing these two new funding mechanisms, we evaluate their relative merits as well as those of the current approach.

REQUESTER FUNDING APPROACH

Existing Frequency Channels

The MAC and DoD Comptroller would need to take two steps to establish budgets to cover losses on existing Frequency Channels. First, MAC would establish yearly budgets based upon the financial history of each Frequency Channel. Second, the DoD Comptroller would earmark the funds in executive agency budgets for use by the requesters. These steps would provide requesters with an automatic incentive to reassess their Frequency Channel services.

TABLE 3-1

NEW FUNDING APPROACHES FOR FREQUENCY CHANNELS

Establishment of:	Approach	
	Requester funding	Military Service funding
Budgets for existing financial losses	<p>Based on prior-year loss records</p> <p>Funds earmarked for requesters</p> <p>Requesters make payment to MAC</p>	<p>Based on prior-year loss records</p> <p>Funds in Military Service budgets</p> <p>Military Services allocate funds to Military Service requesters</p> <p>Military Service requesters make payment to MAC</p> <p>Military Services make payment to MAC for Unified/Specified Command requesters</p>
Budgets for prospective financial losses	<p>Based on theoretical losses</p> <p>Requesters make payments from existing funds</p>	<p>Based on theoretical losses</p> <p>Military Services allocate existing funds to Military Service requesters for payment to MAC</p> <p>Military Services draw from existing funds and make payment to MAC for Unified/Specified Command requesters</p>
New policies and procedures	Military Services earmark funds for requesters	MAC provides Military Services with periodic financial reports on Frequency Channels

New Frequency Channels

A different budgetary procedure would be needed for requesters of new Frequency Channels. On the basis of prospective operating costs and cargo/passenger loads, MAC would calculate the theoretical losses on all new Frequency Channels and charge the requesters accordingly. The requesters would pay for these losses on new Frequency Channels from old funding, not new loss-compensating funding, because the DoD Comptroller would not provide new funding in the first operating year of a Frequency Channel.¹ With old funding at risk, the requesters would be under great pressure to establish more efficient Frequency Channels than in the past.

New Policies and Procedures

For the requester funding approach to work, the DoD Comptroller would need to ensure that Frequency Channel requesters receive funds to cover losses. One procedure might be as follows: the executive agencies (the Military Services) would earmark funds for all requesters whether in a Military Service or Unified/Specified Command, MAC would bill the requesters, and the requesters would pay MAC for any losses on their Frequency Channels. This procedure would give the requesters an incentive to routinely re-evaluate their Frequency Channels, consistent with readiness.

MILITARY SERVICE FUNDING APPROACH

Existing Frequency Channels

The Military Service funding approach also has two steps for establishing budgets to cover losses on existing Frequency Channels. First, as with the requester funding approach, MAC would develop estimates of upcoming fiscal year budgets based upon historical financial records for all existing Frequency Channels.

Second, unlike the requester funding approach, the Military Service approach calls for the Military Services to receive the funds for the losses on existing

¹A cost-reimbursable basis would be an alternative payment mechanism for new Frequency Channels. Under this method, MAC would prepare midyear bills based upon actual costs, and the DoD Comptroller would provide corresponding midyear budgets to the customers for reimbursement of MAC expenditures. The cost-reimbursable basis would offer many advantages because it establishes a rate based upon actual rather than historical experience. However, MAC would need to overcome various technical problems before this procedure could be adopted.

Frequency Channels. The Military Services theoretically could allocate those funds in their entirety to the requesters. However, because the Unified/Specified Commands do not currently receive Second Destination Transportation and related budget category funding, the Military Services would actually cover the financial losses on all Frequency Channels. Moreover, the Military Services' overall priority schemes and allocation processes may result in reprogramming some funding away from the requesters, toward other higher priority uses. To the extent that some of the requesters do not receive full funding from the Military Services, they would have less incentive to reassess their Frequency Channel services and to institute any efficiencies.

New Frequency Channels

For new Frequency Channels, the Military Service funding approach would work somewhat differently. From anticipated operating costs and utilization rates, MAC would calculate prospective losses on new Frequency Channels. The Military Services would pay the losses on new Frequency Channels from old funding; new funding would come only after the first operating year of a Frequency Channel. To avoid putting old funding at risk, the Military Services would have an increased incentive, when considering new Frequency Channels, to scrutinize them for efficiency.

New Policies and Procedures

To make the Military Service funding approach work, MAC would need to provide the Military Services with periodic reports, probably quarterly, on the efficiency of their Frequency Channels. Those reports would be used by the Military Services to identify the funds required for payment of Frequency Channel losses and to influence the efficiency of those Frequency Channels.

EVALUATION OF APPROACHES

In assessing the relative value of the requester funding approach, the Military Service funding approach, and the current approach, we used the following criteria:

1. The incentive for requesters to re-evaluate their Frequency Channel missions

2. The acceptance of the payment mechanism by the requesters, the chief validator, and MAC
3. The amount of analytical workload at MAC
4. The acceptance of the payment mechanism by the DoD Comptroller and the Transportation Policy Directorate.

Some of these criteria are met better by one funding approach and others by a different funding approach, making an overall assessment difficult. For example, as explained below, the application of criterion 3 favors the current approach because it does not require any additional analytical workload by MAC. In contrast, criterion 1 favors the requester funding approach, which provides the greatest incentive for re-evaluation.

To determine the best overall payment mechanism, given such conflicts, we used decision theory to assign quantitative scores to the specific strengths and weaknesses of each approach.² For each criterion, we allocated a 5 scoring total among the three approaches according to their relative strengths. Hypothetically, for a given criterion, if the requester funding approach is judged 1.5 times more preferable than the Military Service funding approach, and the current subsidy approach, in turn, is judged half as preferable as the Military Service approach, then the 5 scoring total would be allocated as follows:³

- Requester funding approach – 2.50
- Military Service funding approach – 1.67
- Current subsidy approach – 0.83.

This scoring process was performed for each of the four criteria. To obtain an overall assessment for each approach, we combined the four criteria scores for that alternative into a composite score. The composite score may be obtained by assigning the same or different weights to the criteria to reflect their relative importance.

²See Saaty, Thomas L., *Decision Making for Leaders*, Wadsworth Publishing, Belmont, Cal., 1982.

³Algebraically, the scores are obtained as follows: Let x represent the Military Service funding score. Then, $1.5x$ is the requester funding approach score, and $0.5x$ is the current subsidy approach score. These three scores total 5. We then solve the following equation for x , which yields all the scores: $x + 1.5x + 0.5x = 5.0$.

Table 3-2 shows the results of this scoring process for each of the three funding approaches. Based on those results, we believe that the requester funding approach is best for improving the efficiency of the Frequency Channels, while maintaining readiness. The Military Service funding approach is second-best, but still preferable to the current approach. Our reasoning is best explained by going through the rationale for the scoring of each criterion.

TABLE 3-2
SCORING ALTERNATIVE FUNDING APPROACHES

Criteria	Approach		
	Current funding score	Military Service funding score	Requester funding score
Requester incentive	0.5	1.7	2.8
Community acceptance	2.0	1.3	1.7
MAC workload	2.5	1.0	1.5
OSD acceptance	0.6	2.0	2.4
Equal-weighted average	1.4	1.5	1.9
Unequal-weighted average ^a	1.3	1.5	2.2

^a We assigned the weights to the four criteria according to our judgment of their relative importance: 0.35 to requester incentives, 0.25 to community acceptance, 0.20 to MAC workload, and 0.20 to OSD acceptance.

Requester Incentive Criterion

It is our judgment that the current approach does the least of the three alternatives to encourage requesters to re-evaluate their missions. Although requesters may cancel or modify inefficient Frequency Channels from time to time, too many Frequency Channels with low utilization rates and large financial losses remain. Moreover, we believe that the Frequency Channel subsidy encourages requesters to defend such airlift even when it is extremely inefficient, which makes it very difficult for the chief validator to effectively regulate this service.

Implementing the Military Service funding approach would certainly improve the efficiency of Frequency Channels. To the extent that the Military Services receive loss-compensating funds and allocate them to the requesters, the requesters

would have an incentive to introduce efficiencies. However, the realities of the budget allocation process may not always result in full funding to the requesters; if so, the incentives for instituting efficiencies on existing Frequency Channels would be lowered. In any event, the Military Services would have an increased incentive to scrutinize requests for new Frequency Channels because their funds would be put at risk to pay for any first-year operating losses.

The requester funding approach provides requesters with a considerable incentive to institute Frequency Channel efficiencies. By earmarking loss-compensating funds in executive agency budgets to the Unified/Specified Command and Military Service requesters, all requesters would automatically receive full funding, thereby providing the maximum incentive for re-evaluating existing Frequency Channel missions. Moreover, requesters would have an equally strong incentive to ask only for efficient service on new Frequency Channels to avoid putting old funds at risk.

Community Acceptance Criterion

Because the current payment mechanism provides a subsidy to requesters, we believe that they would favor continuation of this arrangement; hence the highest score. However, if the subsidy is removed, then the requesters favor assuming full financial responsibility for introducing Frequency Channel efficiencies. The requesters, the chief validator, and MAC have less enthusiasm for the Military Service funding approach, believing that it would not provide as much incentive for efficiency changes as the requester funding approach.

MAC Workload Criterion

Measured against this criterion, the requester and Military Service funding approaches receive low scores relative to the current approach because both would result in a substantial increase in MAC analytical workload. We assigned a mid-level score to requester funding because it would require MAC to calculate the financial losses of existing and new Frequency Channels and to estimate requester budgets to cover those losses. We assigned a still lower score to the Military Service approach because it would require MAC not only to calculate and develop loss-compensating budgets for the Military Services, but also to prepare quarterly reports on the financial condition of all Frequency Channels.

OSD Acceptance Criterion

Both the Transportation Policy Directorate and DoD Comptroller believe that the current approach does not provide adequate financial discipline regarding Frequency Channel operations. The DoD Comptroller believes that furnishing unearmarked funds to the executive agencies, the current procedure, provides only partial incentives to the requesters. As a consequence, the DoD Comptroller would prefer to institute new budgetary procedures – earmarking funds for requesters – to bring about the necessary Frequency Channel efficiencies. The scores for this criterion reflect these considerations.

Overall Assessment

The above criterion-by-criterion reasoning is reflected in the average scores of the alternative funding approaches (Table 3-2). We believe that the requester funding approach provides the financial incentives necessary to cause the requesters to scrutinize the efficiency of their Frequency Channels more closely. Because the requesters set the terms for Frequency Channels, providing them with loss-compensating budgets would ensure that they weigh readiness against efficiency in establishing and operating their Frequency Channels.

CHAPTER 4

CONCLUSIONS AND RECOMMENDATIONS

This chapter presents our conclusions and recommendations for improving MAC's charging practices for Frequency Channel services.

In FY89, more than 90 percent of MAC's Frequency Channels incurred financial losses. The losses totaled about \$90 million. They were caused largely by the fact that requesters set the frequency of flights too high, resulting in cargo and passenger utilization rates that were well below MAC's targeted rates. Even though the requesters essentially determine the service terms for Frequency Channels, they bear no responsibility for operating costs not covered by users. This situation needs to be corrected.

Recommendation. Requesters should assume financial accountability for the operating costs associated with the requested service.

The Air Force recovers losses on Frequency Channels by charging users of Requirement Channels higher rates. These artificially high rates reduce Requirement Channel cargo and passenger utilization rates. They also provide a hidden subsidy for Frequency Channels, thereby encouraging the establishment and retention of Frequency Channel services that add little to readiness and much to costs and inefficiency. MAC needs to improve the efficiency of its airlift channel services.

Recommendation. MAC should eliminate the subsidy for Frequency Channels and lower its rates for Requirement Channel service by a corresponding amount.

The subsidy for Frequency Channels makes regulation of new and existing service extremely difficult. Requesters vigorously defend their need for Frequency Channel service despite, in some situations, negligible utilization rates. Several requesters indicated that they would focus more on efficiency if they (1) were held accountable for unpaid operating costs, (2) received a budget equal to the financial losses on their Frequency Channels, and (3) had the option of paying for losses when

dictated by readiness considerations or else instituting efficiency savings to be reallocated to other transportation and related purposes (within the same budget year). In addition, a Frequency Channel financial model confirms that the requesters hold the key to reducing financial losses. MAC cannot take these actions unilaterally.

For existing Frequency Channel service:

Recommendation. MAC should request the DoD Comptroller to reduce the budgets of Requirement Channel users by an amount equal to the Frequency Channel subsidy provided and earmark those funds for use by requesters of Frequency Channels.

For new Frequency Channel service:

Recommendation. MAC should request the DoD Comptroller to direct requesters of new Frequency Channels to cover, on an interim basis, all first-year losses from their existing funds.

Recommendation. MAC should work with the DoD Comptroller to establish a permanent cost-reimbursable methodology for determining loss rates on new Frequency Channels and for funding first-year losses.

These changes need to be coordinated with the chief validator, who would be the focal point for informing Frequency Channel requesters of their responsibility for any financial losses.

Implicit in all of these recommendations is a requirement that MAC have access to comprehensive and timely utilization, cost, and revenue data. MAC needs to continue to improve its access and use of those data.

Recommendation. MAC should develop an automated airlift management system to better track aircraft utilization, operating costs, and revenues for both Frequency and Requirement Channels.

We believe that these changes will improve the efficiency of airlift services, provide better service to MAC's customers, and reduce transportation requirements and expenditures, while still permitting readiness considerations to be taken into account.

APPENDIX

FREQUENCY CHANNEL FINANCIAL MODEL

INTRODUCTION

To aid in the structuring of a new Frequency Channel payment mechanism, we developed a regression model to analyze the financial condition of Frequency Channels. The model was designed to show how decisionmakers can change operating factors to reduce financial losses. The model also was designed to determine whether placing greater emphasis on regulating airlift or removing the hidden Frequency Channel subsidy would be the most important single course of action for improving the financial condition of the Frequency Channels. The Military Airlift Command (MAC) already has attempted to lower rates for low-priority cargo to help increase aircraft utilization, but it has met with only limited success.¹

In this appendix, we first present the model. Next, we discuss the data and its limitations; then, we discuss the estimation and statistical tests of the model. Finally, we present the results and their implications.

THE MODEL

Equation 1 is a mathematical representation of the factors that may affect the financial condition of 152 FY89 Frequency Channels.

¹Under the Transportation Priority 4 (TP-4) program, when airlift capacity is unused, low-priority cargo may be airlifted at sealift-equivalent rates. Even with such large rate reductions for TP-4 airlift service, Frequency Channels continue to be substantially underutilized and suffer large financial losses. From a theoretical perspective, raising user rates might increase revenues, but it would probably decrease aircraft utilization. The demand for Frequency Channel service is inelastic according to some studies; see, for example, Caruso, P. L. and J. Eisenberg, *The Impact of Alternative Tariff Rates on Military Airlift Command Revenues*, Air Force Institute of Technology, Dayton, OH, September 1984. However, the Civil Reserve Air Fleet (CRAF) program and the current budgetary situation severely constrain such a rate strategy. Even more importantly, there is a need not only to improve the financial condition of Frequency Channels, but also to increase the utilization rates on those channels.

$$FC_i = f(\text{req}_{ij}, \text{cap}_i, \text{dis}_i, \text{mis}_i, \text{ocu}_i, \text{opu}_i, \text{icu}_i, \text{ipu}_i, \text{ocu}_i \times \text{mis}_i), \quad [\text{Eq. 1}]$$

where:

i = the i th Frequency Channel, $i = 1, 2, \dots, 152$

FC = financial condition (millions of dollars)

req_j = 1 if j th requester, $j = 1, 2, \dots, 13$
0 if not

cap = aircraft capacity per mission (tons)

dis = flying hours (per mission)

mis = number of round-trip missions (annually)

ocu = outbound cargo utilization rate (percent)

opu = outbound passenger utilization rate (percent)

icu = inbound cargo utilization rate (percent)

ipu = inbound passenger utilization rate (percent).

Because Frequency Channel rates are established for each budget year and only FY89 data were available, we could not consider the effect of rate changes. Nevertheless, as briefly explained above, we do not believe that a rate-setting strategy could materially improve the utilization and financial condition of Frequency Channels.

Our examination of the effect of requesters on the financial condition of Frequency Channels can be summarized as follows. If the j th requester (req_j) took much more advantage of the hidden subsidy on Frequency Channels than did other requesters, then the j th requester's actions would substantially affect the overall financial condition of Frequency Channels. Such a result would suggest that focusing greater regulatory attention on that particular requester should improve the overall financial condition of Frequency Channels. Alternatively, if all requesters took approximately equal advantage of the subsidy, then it would be very difficult and costly for regulation to improve the overall financial condition of Frequency Channels.

The expected effects of the other independent variables are somewhat more straightforward than the effect of the requester factor. Other things being equal, the

financial condition of Frequency Channels would be worse with more aircraft capacity (cap), longer distances flown (dis), or more annual missions (mis). Each of these service levels are essentially set by the requesters of the Frequency Channels and determine the cost of operations. We believe that the requesters would reduce their service levels — to the degree consistent with readiness — if Frequency Channels were not subsidized, thereby lowering costs and improving the financial condition of Frequency Channels.

The financial condition of Frequency Channels also would be improved with greater outbound cargo utilization (ocu), outbound passenger utilization (opu), inbound cargo utilization (icu), or inbound passenger utilization (ipu). These utilization factors are under the control of the users of the Frequency Channels, and, together with MAC's rates, they determine the revenue from operations. MAC itself can influence cargo utilization rates by extending cargo-holding times at the aerial ports to increase aircraft loads, within Uniform Materiel Movement and Issue Priority System limitations.

Finally, we believe that if the requesters reduced the number of missions, the users would move the same amount of outbound cargo but on fewer flights — thereby increasing aircraft utilization. The model was so constructed that it would detect such a mission-utilization interaction effect on the financial condition of the Frequency Channels (ocu x mis).

THE DATA

The data were derived from MAC's "best route" scenarios, which are based upon four assumptions:

- The FY89 cargo and passenger revenues can be reasonably estimated from FY88 actual movements and FY89 rates.
- The most efficient aircraft is used on all flights, although less efficient aircraft may sometimes be used in reality.
- The mileage is based upon direct nautical miles, but indirect routes may be actually flown.
- The flying-hour costs consist of direct operating costs plus an additional 11.5 percent in estimated support costs.

The best route assumption was applied consistently to all FY89 Frequency Channels. Although not reflecting actual FY89 experience, the resulting data were thought to be useful for determining which operating factors are most important for explaining the financial condition of Frequency Channels.

In FY89, 13 different organizations requested that MAC establish or maintain Frequency Channels. Those organizations are listed below:

- Office of the Chief of Naval Operations
- U.S. Air Force Europe
- Air Force Systems Command
- Department of the Army
- Central Command Air Forces
- Air Force Space Command
- Pacific Command Air Forces
- Alaskan Air Command
- Office of the Commandant of the Marine Corps
- Commander-in-Chief, Southern Command
- Commander-in-Chief, European Command
- Commander-in-Chief, Atlantic Command
- Commander-in-Chief, Pacific Command.

As indicated in Equation 1, a 1-0 dummy variable was used to specify each of the 13 requesters.

MODEL ESTIMATION AND TESTING

We estimated the parameters of the model (Equation 1) by ordinary least squares.² Both linear and logarithmic forms were estimated, with equally good statistical results, $R^2=0.84$. We chose to work with the linear form for ease of

²For a general reference on regression analysis, see Johnston, J., *Econometric Methods*, McGraw-Hill Book Company, New York, 1972. For a more complete discussion on cross-section regression techniques, see Melichar, E., "Least-Squares Analysis of Economic Survey Data," *Proceedings of the Business and Economic Statistics of the American Statistical Association, Journal of American Statistical Association*, 1965.

interpretation and use. However, a nonlinear flying-hour variable performed better than a linear flying-hour variable, and therefore we represented 39 different flying-hour levels with 1-0 dummy variables in an otherwise linear regression.

We did not use a constant term in the model for two reasons. First, there is no financial condition to report for Frequency Channels when their operations cease; the aircraft are maintained and used for other airlift services. Second, the inclusion of categorical flying-hour and requester variables in the equation requires a constraint on the regression to obtain a solution — i.e., to avoid a singular matrix. Constraining the constant term to zero is one way to satisfy this requirement.

Equation 2 presents the regression results. The requester factor, represented by the 13 dummy variables, is not statistically significant by the F-statistic.³ The flying-hour dummy variables, represented by 39 dummy variables, are statistically significant but are not shown to conserve space. The t-statistics for the variables in Equation 2 are shown under their coefficients. When $t = 1.98$ or greater (in absolute terms), the coefficient of the variable in question is significantly different from zero at the 95 percent confidence level.

$$FC = -0.0094mis - 0.0143cap + 0.0298opu + 0.011ocu + 0.0004mis \times ocu \quad [Eq. 2]$$

(-10.95) (-2.36) (+5.08) (+0.99) (+3.30)

All of the variables shown in Equation 2 are statistically significant at the 95 percent confidence level of the t-statistic. The outbound cargo utilization is significant at the 95 percent confidence level without the appearance of its interaction effect with the annual mission variable, but with the mission-utilization interaction term, the significance of the outbound cargo utilization effect is masked.

RESULTS AND IMPLICATIONS

Because the requester factor is not statistically significant, we conclude that no specific requester took more advantage of the Frequency Channels' subsidy than any other requester. Thus, financial losses are a broad-based problem, and applying greater regulatory attention to some requesters would not be effective in reducing overall financial losses.

³The requester factor increases R^2 by 0.027 when added to the other variables in the model, from 0.814 to 0.841. The F-statistic is 1.24 $[0.027/(1.0 - 0.841)]$ at 13 and 95 degrees of freedom, which is not statistically significant at the upper 5 percent of the F distribution.

With the variables in Equation 2 being expressed in different units, it is best to put the variables in common units before comparing their financial effects. The concept of an elasticity is useful for this purpose. For example, the elasticity of financial condition with respect to capacity is the percentage change in financial condition that results from a 10 percent change in capacity. It is a pure number. The capacity-finance elasticity is -0.51 , and it is calculated from the capacity coefficient in Equation 2 (-0.0143 , which represents the financial effect of changing capacity) and the mean values of the two variables (representing their initial levels). This means that for each 10 percent increase in aircraft capacity, a financial loss of 5.1 percent would tend to occur.

Table A-1 shows the elasticity for each of the variables in Equation 2.

TABLE A-1
FINANCIAL CONDITION ELASTICITIES

With respect to	Value
Mission	- 0.80
Capacity	- 0.51
Outbound passenger utilization	+ 0.21
Outbound cargo utilization	+ 0.47

Table A-1 indicates that reducing the number of annual missions is most important for decreasing the losses on Frequency Channels. Each 10 percent reduction in annual missions — such as reducing the average number of missions for a Frequency Channel from 74 to 67 per year — would decrease financial losses by almost 8 percent.

Because most Frequency Channel users must use MAC to move their cargo, decreasing the number of those channel missions simply increases cargo utilization rates — measured by the interaction between annual missions and cargo utilization. This tends to further improve the financial condition of the Frequency Channels. Note that each 10 percent increase in cargo utilization improves the financial condition of Frequency Channels by nearly 5 percent.

Even though requesters and users control aircraft capacity and outbound passenger utilization, those two variables were found not to be important operationally for reducing Frequency Channels' losses.

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<p>The Military Airlift Command (MAC) incurs substantial financial losses on its Frequency Channels (routes flown on a regular schedule). In FY89 alone, 90 percent of MAC's Frequency Channels incurred losses totaling about \$90 million.</p> <p>Users often underutilize Frequency Channels, and requesters, who set the requirements for the service, are not held responsible for the resultant losses. The Air Force passes those losses to users of Requirement Channels (routes flown in response to cargo and passenger requirements) in the form of higher rates. That cross-subsidy encourages excessive Frequency Channel missions, lowers Requirement Channel utilization rates, and makes airlift regulation more difficult.</p> <p>A new payment mechanism is recommended to remove the Frequency Channel subsidy and hold requesters responsible for unpaid operating costs. That payment mechanism encourages requesters to weigh both readiness and efficiency in establishing new and reviewing old Frequency Channels, thereby improving airlift efficiency. The DoD Comptroller and MAC need to take a series of actions to implement the new payment mechanism.</p>				
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